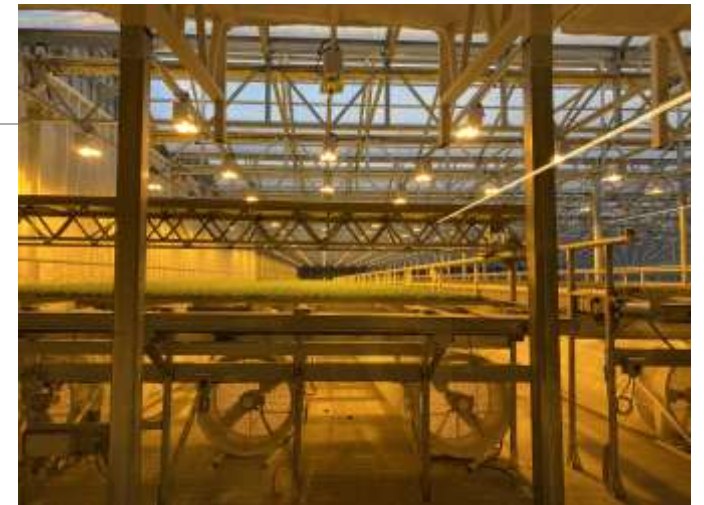




VIRGINIA AGRICULTURAL EXPERIMENT STATION
**VIRGINIA SEAFOOD AGRICULTURAL
RESEARCH AND EXTENSION CENTER**
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Food Safety (HACCP) in Aquaponics and Hydroponics

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NOVEMBER 11TH, 2023

Outline

- ❖ Aquaponics vs. Hydroponics
 - ❖ Most common crops/fish species
- ❖ Food Safety/Regulations
 - ❖ FSMA – PSR
 - ❖ FDA Seafood HACCP
 - ❖ Retail vs. wholesale
 - ❖ HACCP
- ❖ Outbreak
- ❖ Summary



Source: <https://www.vdh.virginia.gov/chesterfield/environmental-health/food-program/food-safety/>

Aquaponics vs. Hydroponics



Source: <https://www.zhaw.ch/storage/lsfm/institute-zentren/iunr/oekotechnologie/aquavet/outcomes/R2-general-description-of-aquaponics-en.pdf>



Source: <https://www.wondriumdaily.com/salmonella-in-hydroponic-lettuce-shows-challenges-in-food-tech/>



Source: <https://attra.ncat.org/publication/aquaponics-multitrophic-systems/>

Crops and Fish Species

- ❖ Lettuce
- ❖ Spinach
- ❖ Herbs
- ❖ Tomatoes
- ❖ Cucumbers
- ❖ Beans
- ❖ Peppers
- ❖ Other

- ❖ Tilapia
- ❖ Channel catfish
- ❖ Hybrid striped bass
- ❖ Other



Source: The University of Vermont - Extension, 2022



Source: USDA, 2023

Regulations – Food Safety Modernization Act.

- ❖ Produce
 - ❖ “Farm” under FSMA
 - ❖ Produce Safety Rule (PSR)
 - ❖ Preventive Control (PC)
- ❖ Terms - PSR
 - ❖ Covered
 - ❖ Qualified Exemption
 - ❖ Exempt
- ❖ Critical areas
 - ❖ Worker training, health and hygiene
 - ❖ Agricultural water
 - ❖ Biological soil amendments of animal origin (manure)
 - ❖ Domesticated and wild animals
 - ❖ Equipment, tools, and buildings



STANDARDS FOR PRODUCE SAFETY
Coverage and Exemptions/Exclusions for 21 PART 112

FSMA - PSR

Covered

- Average annual produce sales >\$500,000

Qualified Exemption

- Sales >\$25,000 AND <500,000 in produce/year AND
- >50% of sales are to ***qualified end-user***

Exempt

- Only grow produce that will have a kill step
- Produce is rarely consumed raw – FDA list
- Average annual produce sales <\$25,000
- Qualified exempt
- Retail >50%

Note: Important when calculating the annual produce sales (average of past 3 years) need to adjust for inflation.

Regulations – Seafood HACCP

❖ Exceptions

- ❖ Harvesting (including Aquaculture unless processing)
- ❖ Transporting
- ❖ Heading, eviscerating, or freezing on a harvest vessel intended solely to hold the fish
- ❖ Retail operations

❖ Retail vs. wholesale

❖ Who has to comply?

- ❖ Anyone who processes fish

FDA GUIDE



Hazard and Critical Control Point (HACCP)

Conduct a Hazard Analysis:

Principle 1 – Conduct a Hazard Analysis

Do not have to write it down, but should

Not required to show it to the FDA

You may not need a HACCP plan

Principle 2 – Identify Critical Control Points

Build a HACCP Plan

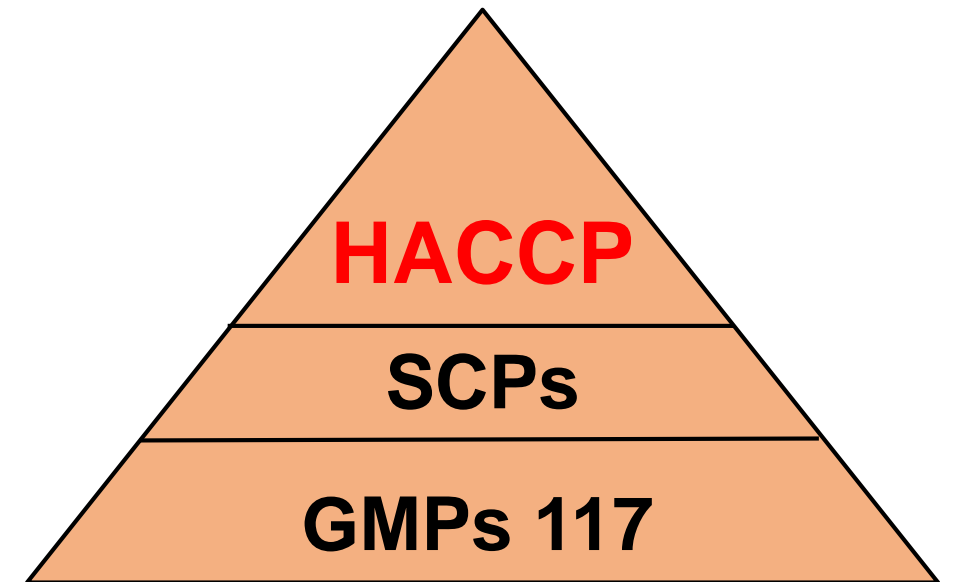
Principle 3 – Set Critical Limits

Principle 4 – Establish Monitoring Procedures

Principle 5 – Establish Corrective Action Procedures

Principle 6 – Establish Verification Procedures

Principle 7 – Establish a Record Keeping System



Fish and Fishery Products Hazards and Controls Guide (FDA)



Initial Product Form	Package Type	Control Measure
CHP 12	CHP 13	CHP 14
CHP 15	CHP 16	CHP 17
CHP 18	CHP 19	CHP 20
CHP 21	CHP 22	CHP 23

TABLE 3-3
POTENTIAL INVERTEBRATE SPECIES-RELATED HAZARDS

Note: You should identify pathogens from the harvest area as a potential species-related hazard if you know or have reason to know that the fish will be consumed without a process sufficient to kill pathogens or if you represent, label, or intend for the product to be as consumed. (See Chapter 6 for guidance on controlling pathogens from the harvest area.)

MARKET NAMES	LATIN NAMES	HAZARDS			
		Pathogens	Parasites	Natural Toxins	Environmental Chemicals
		CHP 4	CHP 5	CHP 8	CHP 9
					CHP 11

TABLE 3-4
POTENTIAL VERTEBRATE SPECIES-RELATED HAZARDS

Note: You should identify pathogens from the harvest area as a potential species-related hazard if you know or have reason to know that the fish will be consumed without a process sufficient to kill pathogens or if you represent, label, or intend for the product to be as consumed. (See Chapter 6 for guidance on controlling pathogens from the harvest area.)

MARKET NAMES	LATIN NAMES	HAZARDS		
		Parasites	Natural Toxins	Environmental Chemicals
		CHP 4	CHP 5	CHP 8
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SPECIES HAZARDS

4. Pathogens (harvest)
5. Parasites
6. Natural Toxins
7. Scombrototoxin
8. Other Decomposition-related hazards
9. Environmental Chemicals
10. Methylmercury
11. Aquaculture Drugs

PROCESS HAZARDS

12. Pathogen Growth & Survival
13. *C. botulinum* toxin
14. Pathogen Growth & toxin formation inadequate dying
15. *S. aureus* toxin
16. Pathogen Growth & Survival cooking
17. Pathogen Survival process designed to retain raw
18. Intro. of pathogens after pasteurization and specialized cooking
19. Allergens & Food additives
20. Metal inclusion
21. Glass inclusion

Factors Potentially Contributing to the Contamination of Packaged Leafy Greens Implicated in the Outbreak of Salmonella Typhimurium During the Summer of 2021

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Outbreak

In July and August of 2021, the U.S. Food and Drug Administration (FDA), Centers for Disease Control and Prevention (CDC), and state partners conducted an outbreak investigation into a multistate outbreak of *Salmonella* Typhimurium linked to packaged leafy greens produced at a Controlled Environment Agriculture (CEA) indoor hydroponic operation.^[1]

Total Illnesses: 31

Hospitalizations: 4

Deaths: 0

First illness onset: June 10, 2021

Last illness onset: August 18, 2021

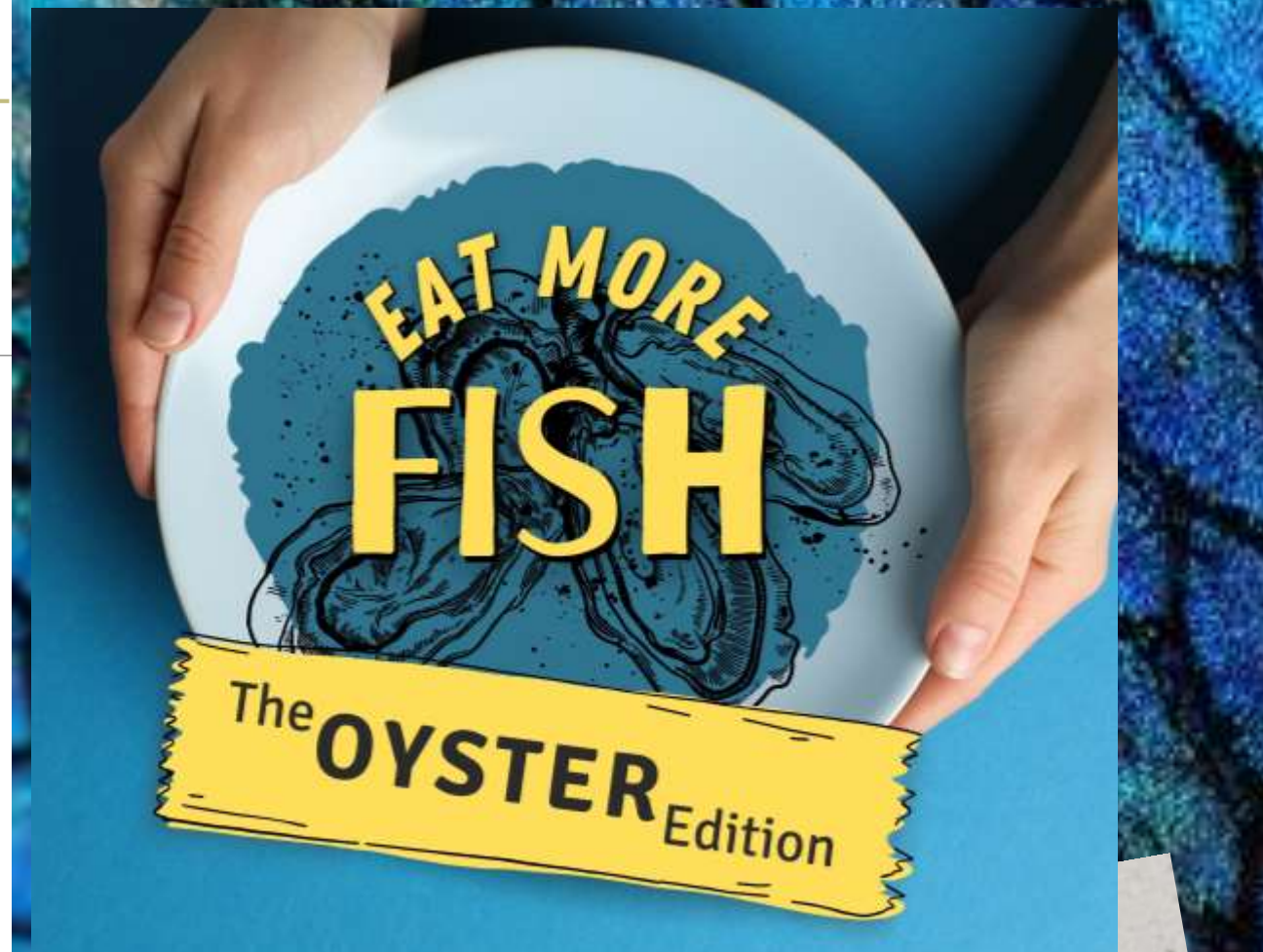
States with Cases: IL (18), MI (1), PA (2) WI (10)

Summary

- ❖ Even if you are exempt
 - ❖ Records are needed PSR
 - ❖ Records are highly encouraged for seafood products
- ❖ Sanitation Standard Procedures
 - ❖ Hydroponics
 - ❖ Aquaponics
- ❖ As a farm, you might be asked for **Letters of Guarantee or Supplier Verification Letters**
 - ❖ Drug usage for fish
 - ❖ Handling practices

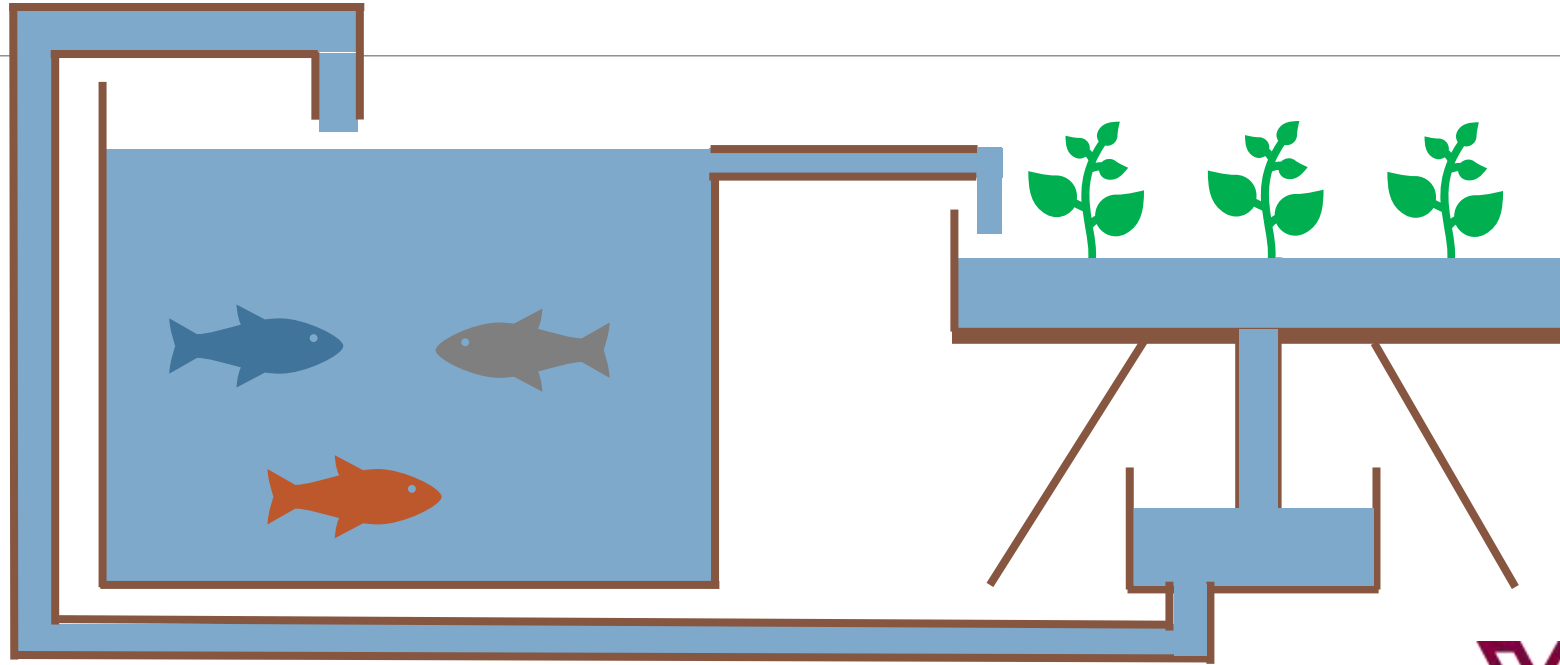
Seafood Consumer Education

- Promote the consumption of local Virginia Seafood
 - **Eat More Fish** – VCE Program for building confidence to prepare and enjoy seafood at home
 - Cooking demonstrations
 - Collaborate with local partners





Thank You!



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